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14. ABSTRACT

The purpose of this research is to develop a program of systematic, brief training in role appropriate team behaviors covering key communication, leadership, and team member behaviors for ad hoc emergency medical care teams and to determine whether training in these behaviors results in improved individual and team communication, leadership, and team member performance in simulated emergency care situations regularly experienced by trauma and emergency department medical care teams. In project year three we have completed all data collection, analyzed and interpreted the data, written a draft of the primary manuscript, presented the results at annual national professional meetings for trauma, and emergency medicine and regional meetings of the Association for American Medical Colleges. We have also provided didactic training for health care professionals that were not trained during the original training. We are in the process of preparing the final project report for submission in December 2012.

15. SUBJECT TERMS
Training of role appropriate communication, leadership and team behaviors, ad hoc groups of emergency medical care providers, use of simulation for training of medical care providers

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Introduction

Medical care is increasingly the responsibility of teams rather than individuals. This realization has led to increased team training of medical professionals with a focus on establishing role appropriate team behaviors emphasizing team communication, leadership and team member skills. Emergency departments and trauma centers are unusual care settings in that circumstances provide little time for deliberation and planning at the time of patient care due to the emergency nature of the cases. Furthermore, care is provided by ad hoc teams where the composition of the group responsible for delivery of care is not constant but the roles and responsibilities needed are invariant. Finally, members of the team may enter at various points as the case unfolds. These conditions require special team leadership, communication and team member skills. The purpose of this research is to develop a program of systematic, brief training in role appropriate team behaviors covering key communication, leadership, and team member behaviors for emergency medical care teams and to determine whether training in these behaviors will result in improved targeted individual and ad hoc team communication, leadership and team member behaviors in simulated emergency care situations such as those regularly faced by trauma and emergency department medical care teams.

During the second year we also requested a no-cost extension of the project to allow us time to meet all of the original objectives of the project. This request for an extension was granted on 21-Jul-2011. As a result, the project is now scheduled to be completed 30 Dec 2012. In the second year annual report we reported that we had completed Tasks 1-5 from the revised milestones [Task 1: Develop the training module (Milestone Completion Date: 31 August 2011), Task 2: Development of Simulation Scenarios (Milestone Completion Date: 31 August 2011), Task 3: Data collection and interpretation plan for analyzing individual and team performance data during simulation scenarios, Task 4: Training interventions and the associated simulation scenarios pilot tested. (Milestone Completion Date: 31 August 2011), Task 5: Approval of the project by the local IRB and by the USAMRMC ORP HRPO]. The remainder of this third year annual report will address the progress we have made toward meeting the remaining revised milestones as set down in the approved no-cost extension and accomplishing the original objectives of the project. I am happy to report that the activities and accomplishments by project staff reflect that the project is now on schedule to meet the milestones and complete the project on schedule.

Body

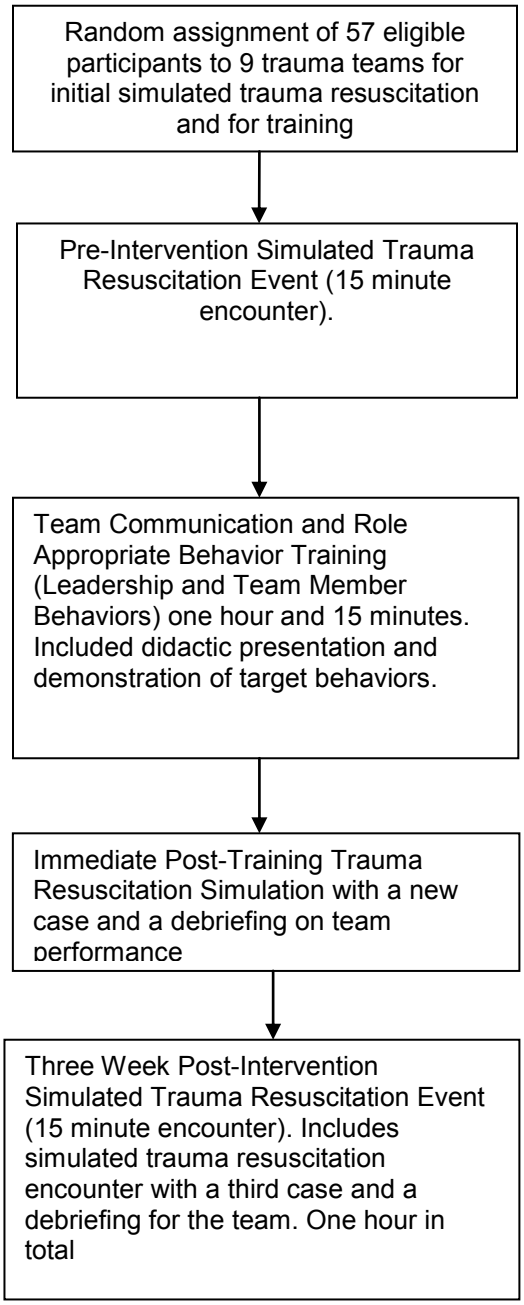
The following provides a description of project accomplishments during project year 3 broken down by the tasks and subtasks spelled out in the approved revised statement of work.

Tasks 6 and 7 Completed for all Participants. Task 6. Training Intervention Completed for All Participants (Milestone Completion Date: 30 September 2011). Task 7. Pre, Post and Three week post simulation scenarios administered to all participants (Milestone Completion Date: 30 September 2012)

Training was completed for all participants. Participants included 57 medical hospital staff (emergency department nurses specially trained in trauma care, emergency medical technicians, respiratory therapists) and physicians (general surgery and emergency medicine residents) who worked in trauma teams in the emergency department and the Level One trauma center at Memorial Medical Center. Third to fifth year general surgery residents served as team leaders. First, second, and, on occasion. third year residents served as supporting

physician members of the teams. These individuals were randomly assigned to teams for simulated trauma resuscitations. This method mirrored the way that ad-hoc teams are formed to provide emergency care in the emergency department and trauma center. An Emergency Medical Technician (EMT) who was not a study participant was trained to present the case in a standard manner. Figure 1 summarizes the design of the study. Table 1 provides a description of the behaviors targeted for training.

Figure 1. Study Design



The pretest simulated trauma encounter (STE) utilized high fidelity inanimate computer driven simulators and took approximately 15 minutes to complete. These pre–intervention data were

used to estimate baseline performance The STEs were video and audio recorded to allow analysis of targeted individual and team behaviors.

After the baseline STE, team members participated in team training designed to develop the team leader and member behaviors chosen to improve team communication, leadership and other role appropriate team behaviors. The training concluded with team practice with a second standardized patient STE which was also used to measure acquisition of target behaviors. The teams were debriefed after this post-training STE to help cement desired behaviors and to correct undesirable behaviors.

Approximately three weeks later, participants were assigned to new teams, reassembled, and asked to participate in a third, different, high fidelity STE to measure post-intervention leader and team member behaviors. These STEs were also video and audio recorded for analysis and followed by a team debriefing session. Participants were debriefed after this three week post intervention retention STE. The STEs were randomly distributed amongst the pre-intervention, immediate post-intervention and three week post intervention conditions to control for possible differences in case difficulty

Task 8. Team performance During Pre, Immediate Post and Three Week Post Intervention STEs were analyzed and interpreted. (Milestone Completion Date: 31 March 2012)

Outcomes and Measurements. We used Kirkpatrick's Hierarchy (KH) of evaluation (1) to guide our choice of outcome measures. The primary outcome for the study was changes in individual and team behaviors (KH level 3). These changes were measured by comparing video records of pre intervention, immediate post intervention and delayed post-intervention STEs. We investigated coded frequencies of trained behaviors and quality of those performances using the criteria specified in the training.
Secondary outcomes included:

- Percent who completed training and views on the learning experience, its organization, presentation, content, teaching methods (KH 1)
- Intention to apply knowledge and skills learned (KH 3)
- Other attitudes regarding the knowledge and skills learned (KH 3)

Raters. A surgeon and a nurse who were blinded to the study group independently rated each audio/video record Raters blindly rated five of the audio video records twice with new video record IDs, which allowed us to test within rater agreement. We trained the raters by introducing and talking about the rating form, which we modified based on their suggestions. We then reviewed a video and rated it together, then viewed a second video and allowed the raters to rate it and discuss their ratings and perceptions.

Data Analysis. We documented the impact on the trainees by determining attitudes toward the program, clarity and nature of expressed intentions to change personal work behavior, and clarity and nature of expressed intentions to advocate for changes in work practices of the department and organization. Additionally we analyzed differences in ad-hoc individual and team performance on the STEs in each study group. The unit of measurement was the performance of the team rather than that of the individuals in the group.

Statistical Analysis. Within rater agreement was determined using both the relative ranking and absolute agreement models of intraclass correlation coefficients. The first determines the degree to which the rankings of the targeted video were similar on the first and second

evaluations. The second determines the degree to which the absolute rating assigned on both rating occasions agreed. Attitudes toward the course and toward the targeted training behaviors were analyzed by determining the number and percent of respondents choosing each response option. Comparisons between pre training, immediate post training and three week retention video records of team performances were compared using one-way analysis of variance. Selected target behaviors and combinations of target behaviors (e.g. SMARTT Stepback behaviors) were also singled out for analyses. In these cases the frequencies of occurrences and percent of occasions where the behaviors occurred were determined. All analyses were performed using Statistical Package for the Social Sciences Software (SPSS) version 19 (IBM SPSS, Chicago, Illinois).

Results

Table 2 provides the results of the within rater agreement analyses broken down by rater (surgeon, nurse) and by scale. The conventionally accepted standard for reliability correlations is 0.80 and above though this standard is often not obtained when using human raters. Our findings demonstrated that the nurse rater achieved this 0.80 standard of consistency in most of the measurements included in Table 2 regardless of the model being used. The surgeon rater's results were lower than those of the nurse rater. For subsequent analyses we combined the surgeon and nurse rater's ratings.

Table 3 provides a summary of participant responses to the post-training questionnaire regarding their perceptions of the training. Forty five participants (79%) completed the post-training questionnaire. Two participants did not identify their medical role. Their responses are included in the Total columns. The first six items established participants' perceptions about the process and content of the training. The predominant response for all items was "strongly agree" with the exception of the item regarding "training being a good use of the respondents' time". Within these six questions, there were six "undecided" responses. Four of them were responses to the questions about being a good use of the respondents' time. The undecided responses were fairly evenly distributed among the three groups of professionals.

Questions 7 through 11 asked the participants for their opinions regarding the potential benefits of the target training behaviors for the quality and efficiency of patient care and patient outcomes. For all five questions the majority of participants strongly agreed that the training had the potential to improve patient safety, care efficiency, team functioning, clarity regarding team leadership, better communication, situation awareness, and mutual support. Item 12 asked participants to indicate whether they intended to apply the skills learned in their work environments. Again the predominant response was "strongly agree".

Across these 12 items, physician respondents were more positive about the benefits of the training and the potential quality and care outcomes than were nurses and medical technicians although all responded favorably with the exception of the one nurse mentioned earlier. The final item on the post-training questionnaire asked the participants to indicate whether they had already used any or all of the trained skills in their work environment. Twenty six participants (58%) indicated they had used some of the trained skills already. Two indicated they had not and 16 said they had not had an opportunity to use the trained skills yet due to the fact that at the time of training the Level One trauma center was at the other teaching hospital in Springfield.

Table 4 provides a summary of the team results. Cells highlighted in light grey indicate statistically significant differences in team and leader behaviors that suggest the training had desired training effects. Cells highlighted in dark grey indicate statistically significant differences

in team behavior that indicate a significant reduction in desired team and leader behaviors at the three week retention endpoint compared to the immediate post-training endpoint.

As can be seen in Table 4, 14 out of 17 targeted team and leader behaviors significantly improved immediately following the training. One area where team and leader behaviors did not improve included team member efforts to clarify ambiguous orders. It is not clear whether this result reflects situations with ambiguous orders where team members did not attempt to clarify the ambiguity or the finding reflects the lack of ambiguous orders and thus the opportunity and need to seek clarity. We believe the former is the more accurate explanation. The second area where improvements were not observed involved whether the team leader was clearly identifiable. As can be seen in the pre-training simulation results, the judges' ratings indicate that the team leader was easily identified prior to training. This result may indicate the lack of a need for training in this specific area. The third area where training effects were not manifested in the results involved team leader management of noise. Anecdotally observers independently commented on the fact that there was less extraneous noise in these STEs than is normally true in trauma events. This artifact may explain the lack of significant differences observed. Comparing the pre-training with three week retention results indicates that seven areas had lasting training effects. Moreover, four of these seven areas (efficiency, listened to information, orders were carried out, cooperation and communication) are all critical indicators of effective team performance. One area where there was a critical relapse in team behavior was team member confirmation when they completed tasks. This area requires additional attention.

Table 5 indicates the number of team members who introduced themselves to the scribe upon arrival. As can be seen by inspecting the table, the number of team members who announced themselves before training was virtually zero and this was true regardless of profession. The rate of introductions improved immediately after training and was maintained at a slightly lower rate after three weeks. However the rate is still not 100%.

Table 6 summarizes the number of teams where at least one coordinated, complete SMARTT Stepback occurred during the training simulation. For this Table we recorded that a SMARTT Stepback occurred only if all six components occurred at a single time. As can be seen the frequency of SMARTT Stepbacks increased after training and the rate was sustained after three weeks. However the rate was still less than the desired 100%. Table 7 indicates the number of SMARTT Stepback component behaviors that occurred at some point during each simulation, a much less restrictive indication of training success. In this table a frequency of 9 in a cell would indicate that this behavior occurred one time in that simulation event. As can be seen, the two raters appeared to use a different rating strategy for the pretraining. Their frequencies for the immediate post-training and three weeks retention post training are more similar. Raters recorded each element occurring close to once per simulation event except in the pre-training phase of the study.

Discussion

The in-situ simulation that we conducted showed that residents were not clear on who was leading resuscitations and this resulted in a shifting leadership focus among the residents throughout the trauma resuscitation. Communication was fragmented, incomplete, and frequently interrupted thus requiring repetition. The trauma bay was noisy with several people often talking at once. These findings were confirmed subsequently in observations of actual trauma resuscitations in the trauma bay.

Our training intervention was developed specifically to determine whether a brief training program would lead to changes in team member behaviors that would improve team performance in these areas.

Recently two other studies have addressed similar training needs for ad hoc trauma team members (2, 3). Both of those training interventions involved more training time on the part of participants, compared with our study. Likewise both studies included changes in traditional trauma outcome parameters as well as changes in team behaviors whereas our study focused exclusively on changes in targeted team behaviors manifested in simulated trauma resuscitations. Finally, both studies included attending physicians as participants while our study excluded attending physicians. The primary value that our study adds to the findings of these two studies lies in two areas. First and perhaps most important, our study used expert judges who were blinded to the stage of training for participants. Our raters reviewed audio-video records of all teams performing all trauma simulations at every stage of training. The audio-video records were randomly ordered and the rater did not know the training stage for the performing team. Second, our study added the three week post-training simulation to measure team retention of targeted team and individual behaviors. All three studies demonstrated that relatively brief training episodes can lead to changes in targeted team leadership, communication and coordination behaviors.

In our study all behaviors were observed in STEs where participants knew what behaviors were being observed and recorded which may raise a question about whether the trained behaviors will persist in the actual trauma environment with real patients. However, the results from the Capella et al (3) and Steinemann et al (3) studies provide some evidence to support transfer of the training to real trauma cases. Our study does strengthen the collective knowledge from the three studies by blinding the raters to stage of training and thus minimizing the possibility that raters' judgments are influenced by their knowledge of the training stage. Our results are also conservative in that the retention outcome measure occurs prior to the impact of the second debriefing.

While the results of our study provide evidence that the training is producing intended results, it is clear that the effect is not robust. The targeted behaviors are not present in all teams and the sporadic team behavioral characteristics remind us that the behaviors are likely to fade absent practice and continued hospital leadership support in the form of policies and role modeling. For example inspection of Tables 6 and 7 indicate that, at most, two thirds of the team leaders initiated a complete SMARTT Stepback event during the simulations occurring after training. However many of the elements of a SMARTT Stepback occurred during each post training simulation. This suggests partial success in this portion of the training but certainly also indicates that more training and reinforcement of these coordinated behaviors will be needed if SMARTT Stepbacks are expected to occur on a regular basis.

All team leaders and prospective team leaders were trained and were given opportunity to practice these behaviors as a part of this project. A nucleus group of nursing and emergency department technicians also received the training including the practice simulated trauma resuscitations. All other trauma team members are receiving the didactic training but will not have the opportunity to practice using the simulated trauma resuscitations. The trauma leadership, hospital leadership and emergency medicine leadership are committed to encouraging all team members to incorporate these behaviors into their individual and team practices by providing mandatory training to the remaining trauma nurses and technicians and to the new general surgery and emergency department residents.

Finally we want to echo the views of the investigators in the Capella et al study(3) that the logistics of providing training to teams made up of health care providers from different professions was one of the most challenging aspects of this project. Coordinating the scheduling of these training exercises involved working with five different hospital and residency program administrative bodies. It is no surprise to us that there is a great deal of talk about the desirability of multi-professional team training but the number of examples of such training in hospital settings is limited.

Key Research Accomplishments

- Respondents strongly agreed that the process and content of the training was worthwhile.
- Respondents strongly agreed that the training had the potential to improve patient safety, care efficiency, team functioning, clarity regarding team leadership, better communication, situation awareness, and mutual support.
- Twenty six participants (58%) indicated they had used some of the trained skills already. Two indicated they had not and 16 said they had not had an opportunity to use the trained skills yet due to the fact that at the time of training the Level One trauma center was at the other teaching hospital in Springfield.
- Physician respondents were more positive about the benefits of the training and the potential quality and care outcomes than were nurses and medical technicians although all but one responded favorably.
- 14 out of 17 targeted team and leader behaviors significantly improved immediately following the training. One area where team and leader behaviors did not improve included team member efforts to clarify ambiguous orders. The second area where improvements were not observed involved whether the team leader was clearly identifiable. As can be seen in the pre-training simulation results, the judges' ratings indicate that the team leader was easily identified prior to training. This result may indicate the lack of a need for training in this specific area.
- The third area where training effects were not manifested in the results involved team leader management of noise. Anecdotally observers independently commented on the fact that there was less extraneous noise in these simulated trauma events than is normally true in trauma settings. This artifact may explain the lack of significant differences observed.
- Three week retention results indicate that seven areas had lasting training effects. Moreover, four of these seven areas (efficiency, listened to information, orders were carried out, cooperation and communication) are all critical indicators of effective team performance. One area where there was a critical relapse in team behavior was team member confirmation when they completed tasks. This area requires additional attention.
- The frequency of complete SMARTT Stepback events increased after training and the rate was sustained after three weeks. However the rate was still less than the desired 100%. However the frequency of SMARTT Stepback elements used in isolation did improve.

Reportable Outcomes

Aspects of our findings have been presented in poster form at the

- Association of American Medical Colleges Central Group on Educational Affairs Annual Meetings held in Saint Louis, Missouri on March 29-31, 2012
- Emergency Medicine Council of Emergency Medicine Residency Program Directors Annual Meetings held in Atlanta, Georgia on April 1 - April 4, 2012
- American Association for the Surgery of Trauma Annual Meetings held from September 12-15, 2012 in Honolulu, Hawaii.
- A manuscript describing this research and the findings has been prepared and will be submitted for presentation at the 2013 Annual Meetings of the Association for Surgical Education which is a joint meeting with the Association of Program Directors in Surgery. The manuscript will also be submitted for consideration to be published in the American Journal of Surgery.

Conclusion

While the results of our study provide evidence that the training is producing intended results, it is clear that the effect is not robust. The targeted behaviors are not present in all teams and the sporadic team behavioral characteristics remind us that the behaviors are likely to fade absent practice and continued hospital leadership support in the form of policies and role modeling. For example inspection of Tables 6 and 7 indicate that, at most, two thirds of the team leaders initiated a complete SMARTT Stepback event during the simulations occurring after training. However many of the elements of a SMARTT Stepback occurred during each post training simulation. This suggests partial success in this portion of the training but certainly also indicates that more training and reinforcement of these coordinated behaviors will be needed if SMARTT Stepbacks are expected to occur on a regular basis.

All team leaders and prospective team leaders were trained and were given opportunity to practice these behaviors as a part of this project. A nucleus group of nursing and emergency department technicians also received the training including the practice simulated trauma resuscitations. All other trauma team members are receiving the didactic training but will not have the opportunity to practice using the simulated trauma resuscitations. The trauma leadership, hospital leadership and emergency medicine leadership are committed to encouraging all team members to incorporate these behaviors into their individual and team practices by providing mandatory training to the remaining trauma nurses and technicians and to the new general surgery and emergency department residents.

Finally we want to echo the views of the investigators in the Capella et al study(3) that the logistics of providing training to teams made up of health care providers from different professions was one of the most challenging aspects of this project. Coordinating the scheduling of these training exercises involved working with five different hospital and residency program administrative bodies. It is no surprise to us that there is a great deal of talk about the desirability of multi-professional team training but the number of examples of such training in hospital settings is limited.

This project is progressing according to the approved schedule in the no-cost extension. All revised milestones have been achieved. All key players from the emergency department and the trauma center played active roles in the final design and development of the training and

training materials. They also played key, visible roles in delivering the training and debriefing the teams after simulated trauma resuscitations. Further, while outside the goals of this contract, the didactic portion of this training has now been delivered to more than 90% of health care professionals who provide trauma care at Memorial Medical Center with the goal of training them all. All new general surgery and emergency medicine residents have also received the training and previously trained residents also participated in these sessions as a form of refresher training. The Director of the Trauma Center has informed all health care personnel that his expectations are that the trained procedures will be used routinely in all trauma care situations in this hospital.

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3. Capella J, Smith S, Philp A, Putnam T, Gilbert C, Fry W, et al. Teamwork training improves the clinical care of trauma patients. J Surg Educ. 2010;67(6):439-43.

Table 1. Team Behaviors Targeted for Training

Team Leader Behaviors	Decide what needs to be done and priorities
	Direct orders to specific people by name and or role (e.g. nurse, respiratory technician)
	Issue short, clear orders
	Explicit transitions in team leadership
	Manage noise in the trauma bay
	Manage workload to achieve team balance
	Ensure that team members adhere to orders and protocol
	Encourage all members to volunteer key information
Team Member Behaviors	Introduce self by name and function to the scribe and other team members
	Carry out orders issued by the managing physician and standing orders appropriate to role
	Communicate critical information to all members of the team
	Speak only when necessary for patient care. Minimize unnecessary noise/distraction/talk
	Listen to information provided by other team members
	Verbally confirm orders and completion of tasks
	Seek clarification regarding who is the managing physician when ambiguity exists
Communication Behaviors - SMARTT Stepback (Led by team leader)	Situation (Patient description, injury, status, circumstances)
	Management (Treatment performed)
	Activity (What needs to happen next?)
	Rapidity (What needs to be done first and how quickly?)
	Troubleshoot (What may go wrong and steps to correct or prevent)
	Talk to Me (Encourage all team members to volunteer key information, ask clarifying questions, etc).

Table 2. Within Rater Agreement for Five Repeated Cases (Blindly Rated)

Scale	Within Rater Agreement (Intra-class correlation coefficient)			
	Surgeon Rater		Nurse Rater	
	Relative Ranking	Absolute Agreement	Relative Ranking	Absolute Agreement
Professionals Announced	0.12	0.12	0.84	0.85
SMARTT Step Back (Dichotomous Items)	0.50	0.50	0.84	0.83
SMARTT Step Back (Quality Scale)	0.60	0.57	0.94	0.94
Team Behavior Scale	0.74	0.74	0.85	0.78
Team Leadership Scale	0.54	0.54	0.79	0.77
Trauma NoTechs Scale	0.60	0.58	0.74	0.75
Average	0.52	0.51	0.83	0.82

Table 3. Participant Views on the learning experience, broken down by medical role of respondents (One nurse respondent who responded strongly disagree to all items is excluded from the table to simplify the table)

Training Characteristic	Medical Technician (n = 3)			Nurse (n = 13)			Physician (n = 26)			Total (n = 44*)		
	U	A	SA	U	A	SA	U	A	SA	U	A	SA
1. Training well organized	0	2	1	0	6	7	0	8	18	0	18	26
2. Understood training content	0	2	1	0	7	6	0	8	18	0	19	25
3. Can perform skills that were trained	0	1	2	0	9	4	0	10	16	0	22	22
4. Training was good use of time	1	2	0	1	7	5	2	14	10	4	25	15
5. Skills seem easy to use	0	3	0	0	6	7	1	10	15	1	21	22
6. Content appropriate	0	1	2	0	5	8	1	4	21	1	12	31
7. Use could improve patient safety	0	0	3	0	4	9	0	6	20	0	12	32
8. Use could improve care efficiency	0	0	3	0	5	8	0	6	20	0	12	32
9. Use should improve clarity regarding team leadership	0	0	3	0	4	9	0	3	23	0	8	36
10. Use should result in better communication, situation awareness, and mutual support	0	0	3	0	5	8	0	4	22	0	10	34
11. Use should result in improved team functioning	0	2	1	0	5	8	1	6	19	1	15	28
12. I intend to apply the learned skills in my work environment	0	0	3	0	4	9	0	11	15	0	16	28
Total	1	13	22	1	67	88	5	90	217	7	190	345

*Two respondents did not indicate their medical role. U = Undecided, A = Agree, SA = Strongly Agree

Table 4. Mean ratings (and standard deviations) of targeted and trained ad-hoc trauma team behaviors during simulated trauma resuscitations at each stage in the team training cycle.

Category (Best Possible Score)	**Pretraining**	**Immediate Post Training**	**3 Week Retention**	**Pretraining vs Immediate Post Training**	**Pretraining vs 3 wk Retention**	**Immediate Post Training vs 3 wk Retention**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**p**	**p**	**p**
Organized (5)	2.67 (0.66)	3.67 (0.35)	3.67 (0.50)	0.001	0.001	NS
Efficiency (5)	3.00 (0.67)	3.78 (0.36)	3.78 (0.51)	0.01	0.01	NS
Supportive (5)	3.00 (0.50)	3.67 (0.25)	3.44 (0.46)	0.007	NS	NS
Volunteered Important Information (5)	2.61 (0.55)	3.89 (0.22)	3.28 (0.69)	0.00	NS	NS
Listened to Information (5)	3.06 (0.58)	3.83 (0.25)	3.67 (0.25)	0.001	0.008	NS
Instructions performed (5)	3.17 (0.35)	3.78 (0.26)	3.61 (0.33)	0.001	0.018	NS
Clarified ambiguous orders (5)	1.89 (0.82)	3.00 (1.20)	2.50 (1.04)	NS	NS	NS
Confirmed completion of tasks (5)	1.89 (0.33)	3.06 (0.68)	2.39 (0.55)	0.00	NS	0.03
Leader clearly identifiable (5)	3.78 (0.51)	4.0 (0)	3.83 (0.35)	NS	NS	NS
Leader assigned tasks to team members by name or role (5)	3.11 (0.65)	3.89(0.22)	3.28 (0.67)	0.02	NS	NS

Category (Best Possible Score)	Pretraining	Immediate Post Training	3 Week Retention	Pretraining vs Immediate Post Training	Pretraining vs 3 wk Retention	Immediate Post Training vs 3 wk Retention
	Mean (SD)	Mean (SD)	Mean (SD)	p	p	p
Leader managed noise appropriately (5)	2.41 (1.20)	3.50 (0.84)	3.43 (0.79)	NS	NS	NS
Leader coordinated communication and team activity effectively (5)	2.33 (0.75)	3.44 (0.46)	2.72 (0.67)	0.003	NS	NS
Leader encouraged team members to volunteer key information during SMARTT Step-Back (5)	1.50 (0.71)	3.58 (0.58)	3.25 (1.17)	0.04	NS	NS
TRAUMA NOTECHS						
Leadership (5)	3.72 (0.36)	4.67 (0.43)	4.22 (0.67)	0.002	NS	NS
Cooperation (5)	2.89 (0.65)	4.61 (0.42)	3.94 (0.92)	0.000	0.01	NS
Communication (5)	2.56 (0.46)	4.06 (0.39)	3.50 (0.97)	0.000	0.015	NS
Decision Making (5)	3.67 (0.71)	4.61 (0.70)	4.17 (0.97)	0.05	NS	NS
Situation Awareness Coping with Stress (5)	3.67 (0.71)	4.67 (0.35)	4.39 (0.70)	0.005	0.05	NS

Table 5. Team Members Who Were Announced upon Arrival Broken Down by Profession and by Reporting Rater

	Rater	Chief Resident (n = 9)	ER Technician (n = 6)	Bedside Nurse (n = 18)	Junior Resident (n = 18)	Respiratory Therapist (n = 5)	Total
Pre Training	1	1	0	0	1	0	2
	2	0	0	0	0	0	0
Immediate Post Training	1	7	0	3	3	0	13
	2	9	5	7	8	5	34
Three Weeks Post Training	1	5	0	1	4	1	11
	2	6	5	4	6	1	22

Table 6. Number (Percent) of Simulations where a SMARTT Stepback Occurred as a Coordinated Event (All components occurred at same time) Broken Down by Time and by Rater

Time	Rater One – Frequency (Percent)	Rater Two – Frequency (Percent)
Pre Training	0 (0)	0 (0)
Immediate Post Training	3 (33)	6 (67)
Three Weeks Post Training	5 (56)	6 (67)

Table 7. SMARTT Stepback Components that Occurred During the Simulation Broken Down by Time and By Rater (A single performance which included one instance of the behavior would have a frequency of 9 in each cell)

Time	Rater	Situation	Management	Activity	Rapidity	Troubleshoot	Talk to Me
Pre Training	1	8	8	7	2	2	6
	2	0	0	0	0	0	0
Immediate Post Training	1	9	9	9	8	8	9
	2	6	6	6	6	5	5
Three Weeks Post Training	1	8	8	7	6	4	6
	2	7	8	8	5	6	7